Before we begin, are there any questions from last day's work?

p. 338 # 4, 6, 7

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) draw upon prior knowledge of exponential functions
b) make connections between related logarithmic and exponential equatior
    through investigation

1.7.2: Connections Between Logarithmic and Exponential Equations

Date: _Sept. 13/19_

Consider the graphs of $y = 2^x$ and $y = \log_2 x$.

$y = 2^x$

$y = x$ (Don't forget to tap here after #2)

$y = \log_2 x$

$y = 0$

$x = 0$
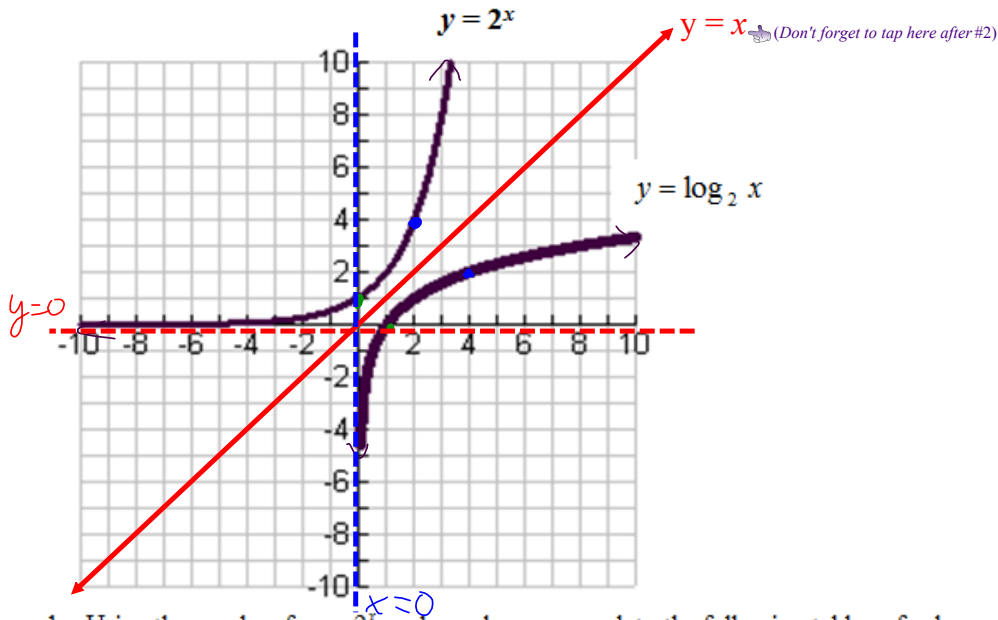
1. Using the graphs of $y = 2^x$ and $y = \log_2 x$ complete the following tables of values.

x	$y = 2^x$
0	1
2	4
3	8

x	$y = \log_2 x$
1	0
4	2
8	3

2. What relationship exists between $y = 2^x$ and $y = \log_2 x$? Explain your findings.

   They are inverse functions.

   $$(x, y) \Rightarrow (y, x)$$

   Ex (0, 1) maps to (1, 0)   (4, 2) maps to (2, 4) *(see the graph)*

3a) If $x = 5$, evaluate $y = 2^x$.

   $y = 2^5$

   $\therefore y = 32$

   $\because 32 = 2^5$ *last*

b) If $x = 32$, evaluate $y = \log_2 x$.

   $y = \log_2 32$

   $\therefore y = 5$

   $\because 5 = \log_2 32$

4. For each function noted below, determine the logarithmic equation.

$y = 3^x$ $y = 5^x$ $y = 11^x$

☞ $\log_3 y = x$ ☞ $\log_5 y = x$ ☞ $\log_{11} y = x$

~~$y = \log_3 x$~~ ~~$3 \times \log_2$~~

5. For each function noted below, determine the exponential function.

$y = \log_4 x$ $y = \log_8 x$ $y = \log_{11} x$

☞ $x = 4^y$ ☞ $x = 8^y$ ☞ $x = 11^y$

6. If you were asked to solve $3^x = 10$, how might you use the corresponding logarithmic equation to help you solve the equation? What other strategy would you consider using?

☞ $\log_3 10 = x$ *Other Strategies*
                         ☞ Trial and Error (Systematic Trial)

                         ☞ $3^2 = 9$ ☞ Intersection Method
                         $3^3 = 27$ ☞ $y_1 = 3^x$ $y_2 = 10$
                         $\therefore x \doteq 2.\underline{\quad}$

1.7.3 Coach and Be Coached

Date: _____

Instructions : One of you is partner A and the other is partner B.
Go through each row by having partner A coach partner B by using appropriate math terms and procedures.
Switch roles and continue through the entire set of questions.

A coaches B	B coaches A
If $x = 64$, evaluate $y = \log_2 x$. ☞ $y = \log_2 64$ so, $2^y = 64$ $\therefore\ y =$ ☞	If $x = 81$, evaluate $y = \log_3 x$. ☞ $y = \log_3 81$ so, $3^y = 81$ $\therefore\ y =$ ☞
For the function $y = 6^x$, determine the logarithmic equation. ☞ $\log_6 y = x$ or $x = \log_6 y$	For the function $y = 8^x$, determine the logarithmic equation. ☞ $\log_8 y = x$ or $x = \log_8 y$
For the function $y = \log_7 x$, determine the exponential equation. ☞ $x = 7^y$	For the function $y = \log_9 x$, determine the exponential equation. ☞ $x = 9^y$
Solve $3^x = 32$. (round to 2 decimal places) ☞ $x \doteq 3.16$	Solve $2^x = 20$. (round to 2 decimal places) ☞ $x \doteq 4.32$

Short cuts = "Laws of Logarithms"

Ex. 1 If $b^x = a$
  and $x = \log_b a$
  then $x = \dfrac{\log a}{\log b}$ ☞

Ex. 2 If $2^x = 32$
  and $x = \log_2 32$
  then $x = \dfrac{\log 32}{\log 2}$ ☞
  $x =$ ☞ (check)
  ☞ 2^5
  $= 32$

Ex. 3 If $3^x = 32$ (round to 3 decimal places)
  and $x = \log_3 32$
  then $x = \dfrac{\log 32}{\log 3}$ ☞
  $x \doteq 3.1546$ ☞
  ☞ $x \doteq 3.155$

  (check)
  ☞ $3^{3.155}$
  ☞ $\doteq 31.977$
  $\doteq 32$

Now solve #6 from 1.7.2 $3^x = 10$ (round to 3 decimal places)

First, convert the equation to logarithmic form. $x = \log_3 10$ ☞①

②☞ Apply the law of logs

③☞ $x = \dfrac{\log 10}{\log 3}$

④☞ Use a scientific calculator to evaluate   ⑤☞ $\doteq 2.0959$

$\doteq 2.096$

Note: the "Log" key by itself is base 10

i.e. $\log 1000 = 3$; $\log 100 = 2$; $\log 0.1 = 1$;
  ☞ $\log_{10} 1000 = 3$
  $\because 10^3 = 1000$

Review the learning goals. Were we successful today?
Homework: p. 344 # 7, 10(a,b), 11

Answer any remaining homework questions
Students ask for "at desk" clarification.